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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/583,120	05/30/2000	SHRIRAM BAGRODIA	05015.0302	1838

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EXAMINER

WYROZEBSKI LEE, KATARZYNA I

ART UNIT	PAPER NUMBER
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1714

DATE MAILED: 11/18/2002

18

Please find below and/or attached an Office communication concerning this application or proceeding.

72-78

<b>Office Action Summary</b>	<b>Application No.</b> 09/583,120	<b>Applicant(s)</b> BAGRODIA ET AL.	
	<b>Examiner</b> Katarzyna W. Lee	<b>Art Unit</b> 1714	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 September 2002.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-10,12-14,18,19,22 and 30-35 is/are pending in the application.
- 4a) Of the above claim(s) 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-10,12-14,18,22 and 30-35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) 1,3-10,12-14,18,19,22 and 30-35 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All   b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 16                      6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1, 5-10, 13, 14, 22, 30, 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinnavaia (US 6,017,632) in view of Cleary (US 6,050,509).

The prior art of Pinnavaia discloses composition for nanocomposite, comprising clay and polymer components.

Although the examples of the prior art of Pinnavaia disclose use of epoxy type polymers, the specification contains suggestion or teaching of using polyamides in nanocomposites as one of the more relevant thermoplastic polymers.

The examples of the prior art of Pinnavaia (E2) further teach that the clay, to be more specific a montmorillonite clay has been purified to remove quartz and other contaminants. Term "remove" is treated based on the definition in Miriam Webster's Collegiate Dictionary as to get rid of and to eliminate. Therefore in view of the above definition, the prior art of Pinnavaia removes quartz contaminant.

The clay material of the prior art of Pinnavaia includes Wyoming-type smectite clays such as sodium montmorillonite (E2) as well as hectorite, saponite and the like (col. 13, lines 47-55). As shown in the examples it can be treated with organic cations such as ammonia (E3)

In the process of the prior art of Pinnavaia, the clay component is first utilized to make concentrate (E20-E24) which concentrate was utilized to make nanocomposite. The final nanocomposite of Pinnavaia according to E5 has 5% by weight of clay content. The concentrate initially has a loading of 50 wt% of clay and 50 wt% of intercalant (E13).

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In the prior art of Pinnavaia clay platelets are exfoliated into clay platelets as well as some tactoids (E25, col. 24), wherein the layers have thickness of 10 angstroms (equivalent of 100 nm).

The articles formed from the nanocomposite of Pinnavaia include piping or seamless floors.

The decreased permeability of the nanocomposite is an obvious property of the polymer compositions comprising exfoliated clay. The decrease of haze is also obvious property of the nanocomposite in view of removal of the impurities.

The difference between the present invention and the prior art of Pinnavaia is explicit recitation of the numerical ranges for the quartz impurities of the clay.

In the event the applicant demonstrates that the "pure" clays in the prior art of Pinnavaia does not meet the numerical limitation of  $\leq 2\%$ , the prior art of Cleary is applied below.

With respect to the above difference, the prior art of Cleary discloses method for purifying clay component. The prior art of Cleary contains a teaching, which would allow one of ordinary skill in the art to utilize the purified clay in nanocomposite composition.

The prior art removes all the impurities, which include all the quartz as well. According to the specification of the prior art of Cleary, the impurities are removed so that clay contains less than 5 wt%, preferably less than about 1 wt% and more preferably less than 1 wt% of total impurities. Since quartz is only small part of the impurity, its amount will therefore be lower than 1% by weight.

In the light of the above disclosure, it would have been obvious to one having ordinary skill in the art at the time of the instant invention to utilize clay of Cleary in the nanocomposite

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of Pinnavaia and thereby obtain the claimed invention. The prior art of Pinnavaia requires purified clay for their nanocomposite, while the prior art of Cleary teaches purifying clays for use in nanocomposites. Combining the two references would result in nanocomposite composition, which would not adversely affect any properties. In fact the haze would be reduced.

5. Claims 3, 4, 13, 18, 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinnavaia (US 6,017,632) in view of Cleary (US 6,050,509) as applied to claims 1, 5-10, 13, 14, 22, 30, 34 and 35 above, and further in view of Beal (US 5,552,469).

The discussion of the disclosure of the prior art of Pinnavaia and Cleary from paragraph 4 of this office action is incorporated here by reference.

The difference between the present invention and the disclosure of the prior art of Pinnavaia and Cleary are different subgenus, oligomeric or polymeric intercalants, as well as recitation of equipment and different articles.

With respect to the above difference, the prior art of Beal discloses oligomeric or polymeric intercalants, which are sorbed in between clay platelets in order to form nanocomposites.

The polymers of the prior art of Beal specifically include polyamides such as poly(*m*-xylylene adipamide), polyhexamethylene adipamide and the like (col. 4, lines 9-15). Since the oligomers are utilized as intercalants and then formed into nanocomposite, the repeat units of the intercalant and matrix polymer will obviously be the same.

The equipment utilized to form nanocomposite of Beal includes various types of mixers as well as extruders and injection molding machines (col. 18, lines 43-45). The articles formed include films, panels and sheets containing other layers (col. 19, lines 24-27).

Combining the compositions of the prior art discussed above would result in nanocomposite, which has good permeability and increase haze.

In the light of the above disclosure, it would have been obvious to one having ordinary skill in the art at the time of the instant invention to utilize the polymer of Beal in the composition of Pinnavaia, since the prior art of Pinnavaia suggests or teaches using polyamides to make nanocomposites. It would have to be obvious to utilize the nanocomposite resulting from such combination to form layered articles, since the prior art of Beal teaches that such articles can be formed. Formed article would have reduced haze and decreased permeability.

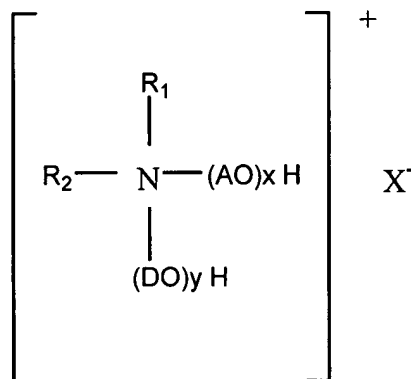
6. Claims 12, 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinnavaia (US 6,017,632) in view of Cleary (US 6,050,509) and Beal (US 5,552,469) as applied to claims 1, 3-10, 13, 14, 18, 22, 30, 31, 34 and 35 above, and further in view of Nae (EP681,990 A1).

The discussion of the disclosure of the prior art of Pinnavaia and Cleary from paragraph 4 and Beal from paragraph 5 of this office action is incorporated here by reference.

The difference, between the present invention and the disclosure of the prior art of Pinnavaia, Cleary and Beal is the disclosure of the oligomeric cations, which can be utilized as intercalants for the clay component.

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With respect to the above difference, the prior art of Nae discloses ammonium salt-organic cations, which are utilized as intercalants for the smectite type clay. The intercalant of Nae has following formula:



Where R1 and R2 are independently selected from linear or branched alkyl group having 1-22 carbon atoms, while AO and DO are polyalkoxylated groups. Alkoxy groups have 2-8 carbon atoms.

Although the prior art of Nae does not teach the composition of nanocomposite, it teaches that the ammonium salts utilized can intercalate in-between the clay platelets and then can gel.

In the prior art of Pinnavaia it is also specifically disclosed that the clay concentrate is in form of a gel as well in col. 21 line 20.

Utilizing polyalkoxylated ammonium salts with the smectite type clay will result in intercalation of the clay components where the basal spacing is increased enough to allow further intercalation of polymeric species.

In the light of the above disclosure it would have been obvious to one having ordinary skill in the art at the time of the instant invention to utilize polyalkoxylated ammonium salts of Nae instead of ammonium intercalant of Pinnavaia and thereby obtain the claimed invention.



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Polyalkoxylated ammonium salts would still intercalated in between the clay platelets, because they have the same functionality, which is positively charged nitrogen. The intercalated clay would also form a get as taught in the prior art of Pinnavaia. Incorporating such clay into the polymeric component would also result in efficient exfoliation and thereby formation of nanocomposite.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katarzyna W. Lee whose telephone number is (703) 306-5875. The examiner can normally be reached on Mon-Thurs 6:30 AM-4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (703) 306-2777. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



KIWL

November 14, 2002